Homework 12: User Manual

Due: Thursday, April 21, at Classtime

Team Code Name: FIREBot **Group No. 1**

NOTE: This is one of the last sections needed to finish the Final Report. This homework will count for 4% of each team member's grade, and therefore all team members should participate equally in completing it. The User Manual should be about 5 pages in length (one page per bullet).

User Manual Outline:

- **Brief (marketing-style) product description**
- **Product illustration annotated with callouts for each control/display**
- **Product setup instructions**
- **Product use instructions**
- **Product troubleshooting instructions**

Evaluation:

Component/Criterion	Score	Multiplier	Points
Product description	0 1 2 3 4 5 6 7 8 9 10	X 2	
Product illustration with callouts	0 1 2 3 4 5 6 7 8 9 10	X 2	
Product setup instructions	0 1 2 3 4 5 6 7 8 9 10	X 2	
Product use instructions	0 1 2 3 4 5 6 7 8 9 10	X 2	
Product troubleshooting instructions	0 1 2 3 4 5 6 7 8 9 10	X 2	
		TOTAL	

FIREbot

The (F)ully (I)ntegrated (R)obotic (E)xtinguisher!

The FIREbot is the fire protection system of the future. The FIREbot's ability to quickly seek and destroy small fires prevents damage to your home or office caused when small fires are allowed to spread. Utilizing a vast arsenal of on-board sensors, the FIREbot will accurately detect the presence of a flame as small as a match up to 5 meters away! Upon the detection of a fire, the FIREbot intelligently calculates the approach path to the fire. With its siren blaring, the FIREbot maneuvers into position. With the flame is in its sights, the FIREbot unleashes a blast of dry chemical agent – immediately extinguishing the flames. Another disaster prevented by the FIREbot!

The FIREbot is designed for your protection, with convenience in mind. Whether you are busy around the house or away for the day, the FIREbot will protect your home in the appropriate manner. When you need the most universal protection from fire, the FIREbot should be operated in Patrol Mode. Using feedback from four infrared proximity sensors, the FIREbot will maneuver around your home, following the wall and avoiding any obstacles. The first sight of a flame will activate the FIREbot's search and destroy algorithm. If you prefer more discreet fire protection, set the FIREbot to One-Eye-Open Mode. Although it is silent and still, the FIREbot is ready to burst into fire-fighting action. Placed near a wall, it can detect a flame anywhere in the entire room!

The FIREbot is also designed to be easy to use. The standard home fire extinguisher it carries is easily replaceable – simply unclip the straps and swap out the old for the new. In less than a minute, FIREbot is ready to go. The FIREbot's high capacity rechargeable battery allows for hours of tireless patrolling. It can wait with One Eye Open for days without the need to recharge. You will always know what FIREbot is doing thanks to the large four line character LCD mounted on the FIREbot's rear panel. The display is angle-mounted for crystal-clear viewing while the FIREbot rests on the floor. On the display, you will find detailed information about the current mode of operation as well as battery charge status. Below you will discover how easy it is to get started using your FIREbot fire protection system.

The FIREbot Control/Display Panel

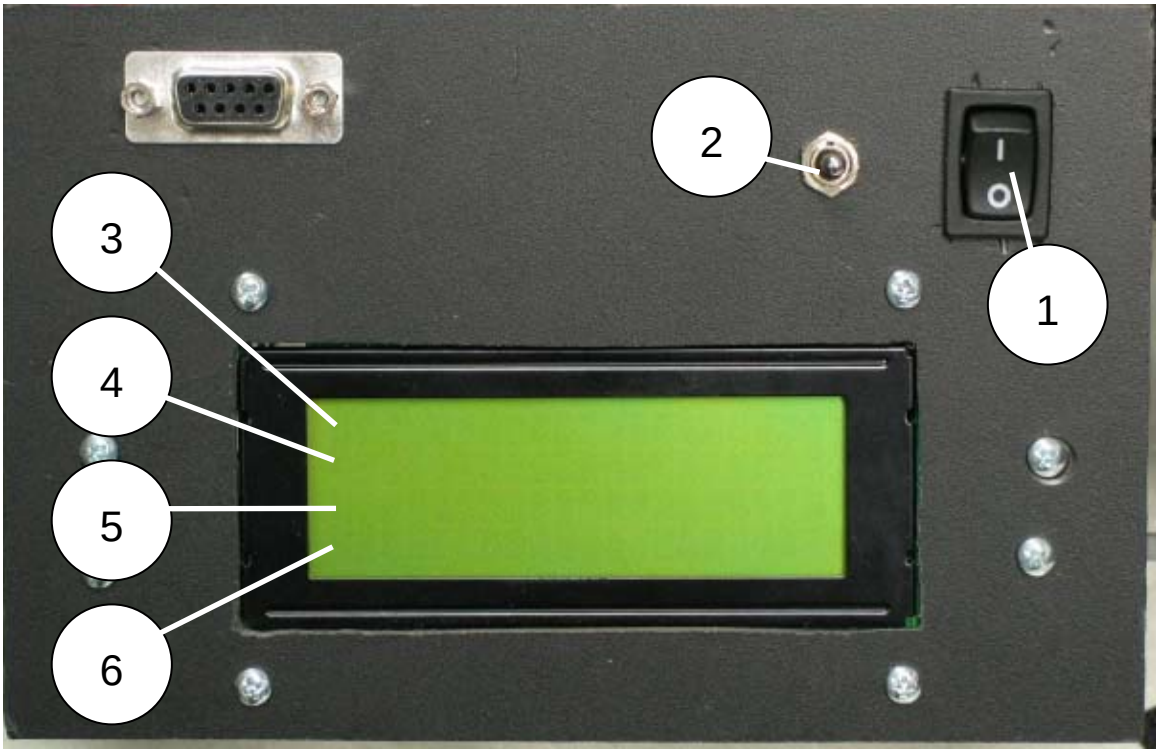


Figure 1. FIREBot Display & Controls

Controls

1. Power On/Off switch – This switch controls main power to the FIREbot.
2. Mode selector switch – This switch controls the mode that the robot will operate in. Move the switch to the up position for Patrol Mode. Move the switch to the bottom position for One Eye Open Mode. The middle position is not used during normal operation. This setting will cause the robot to remain inactive.

Display

3. LCD Line 1: Information about the mode that the FIREbot is operating in is displayed here.
4. LCD Line 2: Information about the FIREbot's current operation is displayed here.
5. LCD Line 3: Battery voltage status is displayed here.
6. LCD Line 4: Miscellaneous information.

FIREbot Setup Instructions

Package Contents

- FIREbot platform with sensor tower
- Rechargeable battery
- Fire Extinguisher
- Plastic tube

Before the FIREbot can be used, the fire extinguisher must be installed and the battery must be charged and installed.

Charging the Battery

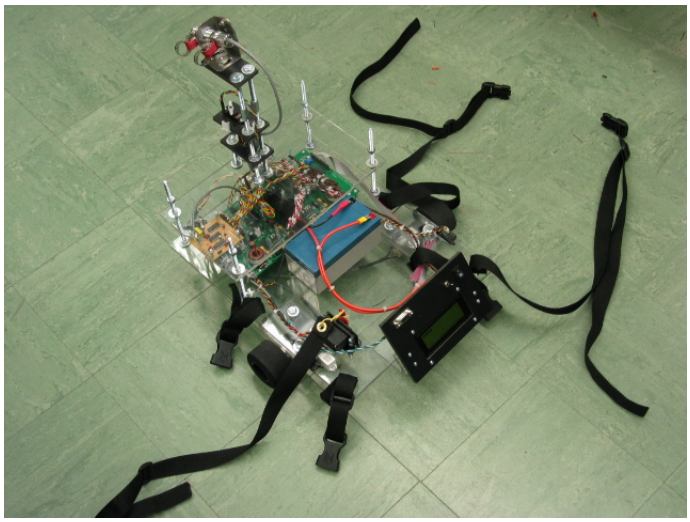
Disconnect the black and orange wires from the battery terminals. Plug the charger into a power source and clip the charger leads to the battery terminals, matching the black clip with the black terminal and the red clip with the red terminal. Charging is complete when the led on the charger turns green.

Installing the Battery

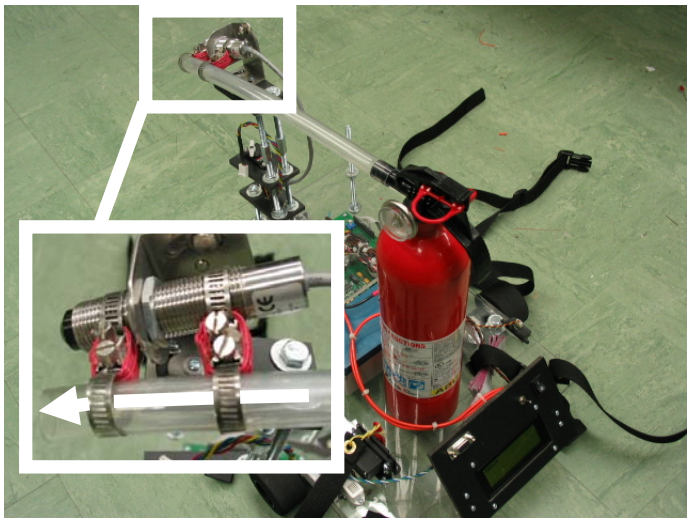
Connect the black and orange wires to the battery terminals by pushing them firmly into place. Ensure the black wire attaches to the black (negative) terminal of the battery and that the orange wire attaches to the red (positive) terminal of the battery.

Installing the Fire Extinguisher

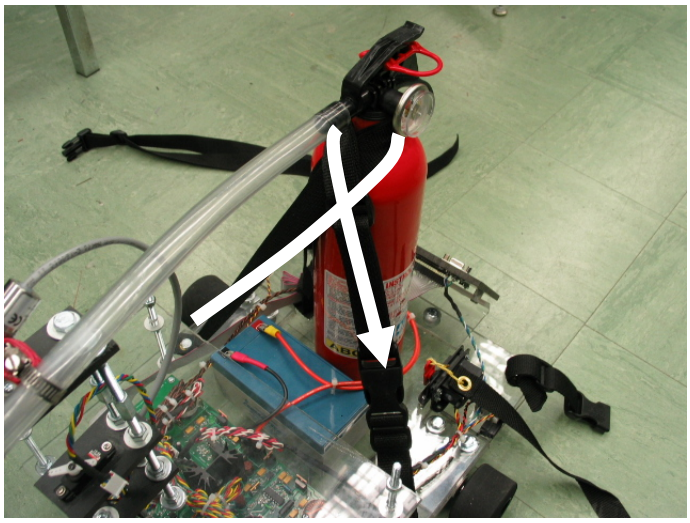
1. Unhook all the straps and lay them out on the floor, clearing the space in the center of the platform where the fire extinguisher will sit.



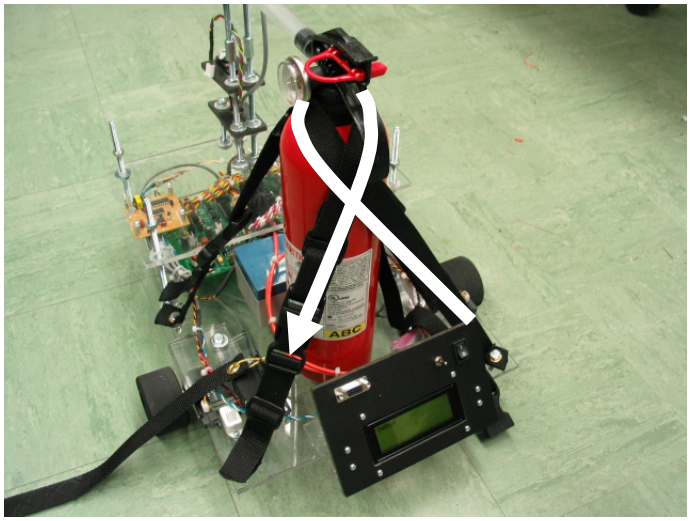
2. Place the fire extinguisher on the FIREbot platform. Attach the plastic tube to the fire extinguisher's nozzle and route the tube through the guide rings on the sensor tower.



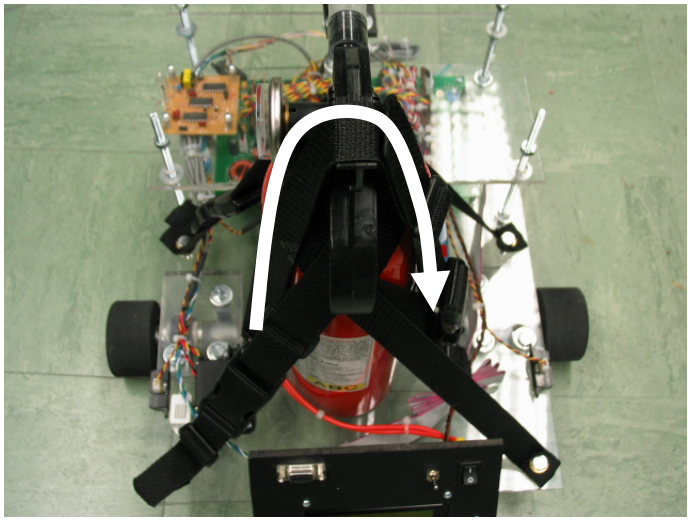
3. Loop the front strap around the neck of the extinguisher and adjust the strap before locking it into place.



4. Loop the rear strap around the neck of the extinguisher and adjust the strap before locking it into place.



5. Loop the extinguisher trigger strap around the extinguisher trigger. Remove the extinguisher lock pin and adjust the strap before locking the strap into place.



The FIREbot is now setup and ready for use.

Product Use Instructions

The FIREbot has two main operating modes, described in detail below. While using the FIREbot, it is critical that any stairways or ledges that the FIREbot could fall off be blocked in some way. To activate the FIREbot:

1. Toggle the mode switch to the desired mode.
2. Turn the power switch on.

It is OK to turn the FIREbot's power switch off at any time during operation. Perform this operation to keep the FIREbot from continuing along an unsafe path.

If for any reason the battery will not hold a charge, replace it with a 12V 3-Ah rechargeable lead-acid battery.

Patrol Mode

When the FIREbot is in patrol mode, it will actively search for fires. To do so, it will maneuver around the room in such a way that it "keeps its right hand on the wall." The FIREbot can be powered up in Patrol Mode from any point in a room, but it will first seek out a wall to follow. When the UVTron sensor detects a fire, the FIREbot will attempt to locate the position of the fire, move directly towards the fire, and extinguish the fire. Once the FIREbot detects a fire, it will alert the user with a pulsing buzzer sound. The buzzer will stop pulsing and remain on for a few seconds immediately before the FIREbot releases the chemical agent to extinguish the fire.

One-Eye-Open Mode

The FIREbot will wait in its current location, silent and still until a flame is detected by the UVTron sensor. When a flame is detected, the FIREbot will attempt to locate the position of the fire, move directly towards the fire, and extinguish the fire. As the FIREbot wakes up to find the fire, it will alert the user with a pulsing buzzer sound. The buzzer will stop pulsing and remain on for a few seconds immediately before the FIREbot releases the chemical agent to extinguish the fire.

Troubleshooting Instructions

Problem	*Possible Solution*
Power LED does not turn on when the power is switched on.	Check the battery terminal connectors for good connections and correct polarity.
	Charge the battery.
	Replace the battery. See "Replacing The Battery" below.
FIREbot does not wake up from "One-Eye-Open" mode.	Ensure that the UVTron has an unobstructed view of the FIREbot's left side. Clean the UVTron sensor with a damp cloth if necessary.
FIREbot does not appear to be approaching the fire directly; the approach path is excessively zigzagged.	Adjust the blinders on the servo sensor PCB. The blinders should be parallel with the lines printed on the top layer of the PCB.
FIREbot does not detect obstacles properly.	Ensure that all four proximity sensors have an unobstructed view. Clean the lenses of the proximity sensors with a dust cloth if necessary.
The extinguisher trigger is not actuated by the servo motor.	Remove an obstacle in the way of the servo motor's range of movement.
	Remove the locking pin from fire extinguisher.
	Check the extinguisher trigger strap and ensure that it is tight and unrestrained by any other obstacles.